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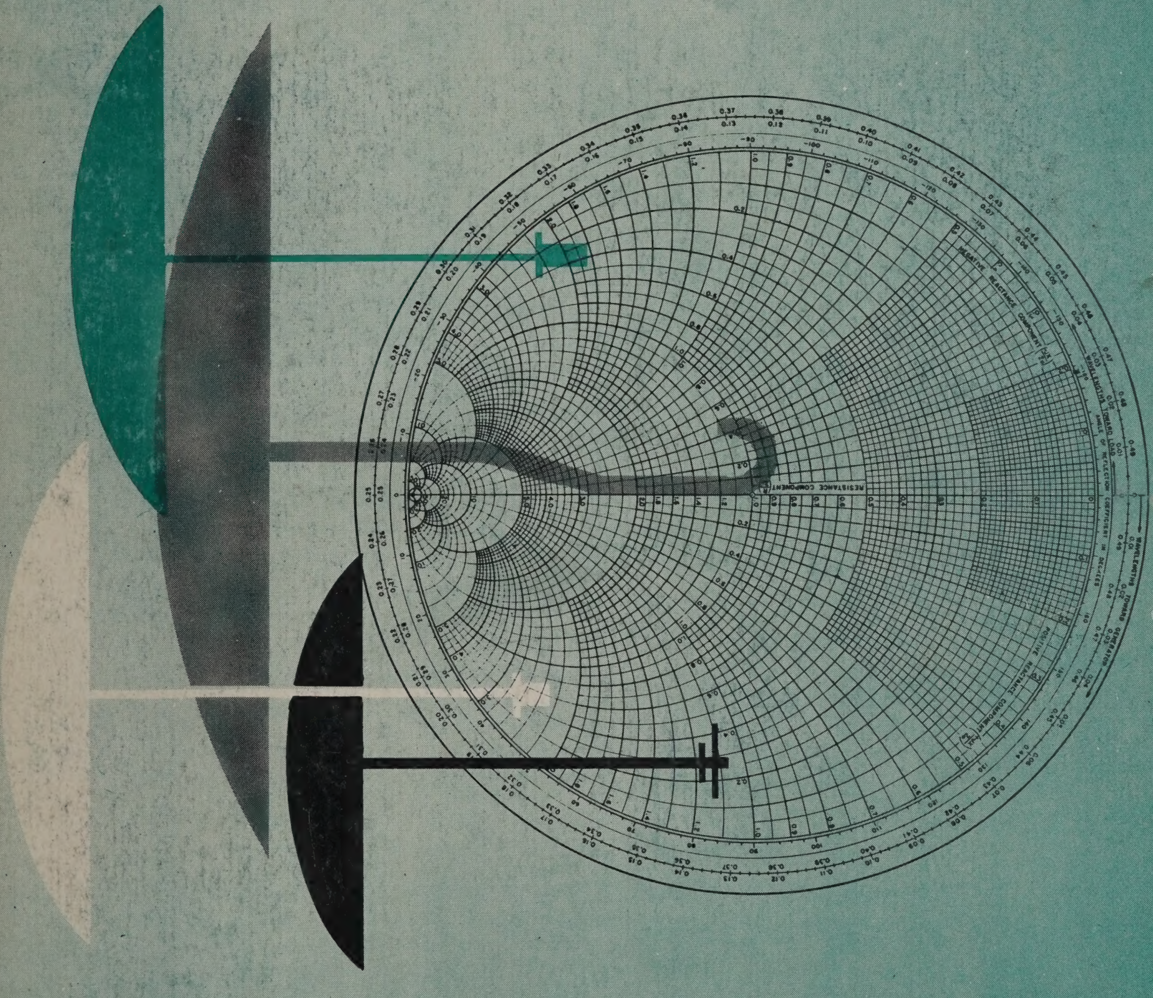
JULY 1961
40 CENTS

COMMUNICATION HORIZONS



DEVOTED ENTIRELY TO TWO-WAY RADIO

SPECIAL

EIA Private Microwave Report
(Page 16)

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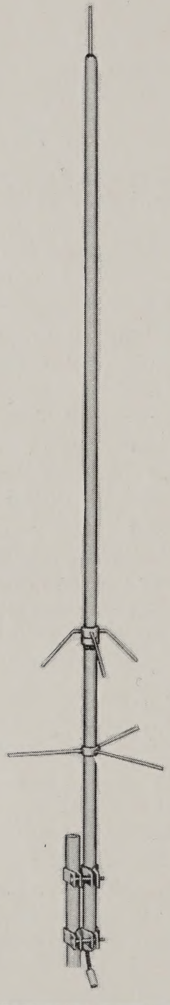

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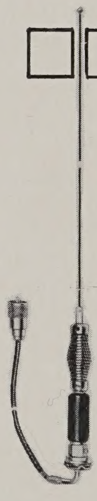

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½ wave length with 3 db gain doubles transmitting power and is 1.56 times more sensitive to reception. Sealed tamper-proof transformer.

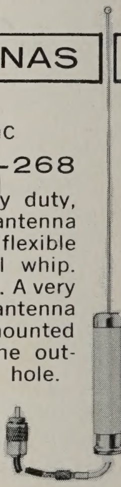
MODEL ASP-203 Kit to adapt ASP-177 to fit GE and RCA mounting Base and convert these models to ½ wave length.

MODEL ASP-206 Same as ASP-203 for Motorola models.

30-50 mc

Model ASP-268

This is a heavy duty, Base loaded antenna with extremely flexible stainless steel whip. Only 44″ overall. A very neat appearing antenna that can be mounted entirely from the outside into a ¾″ hole.



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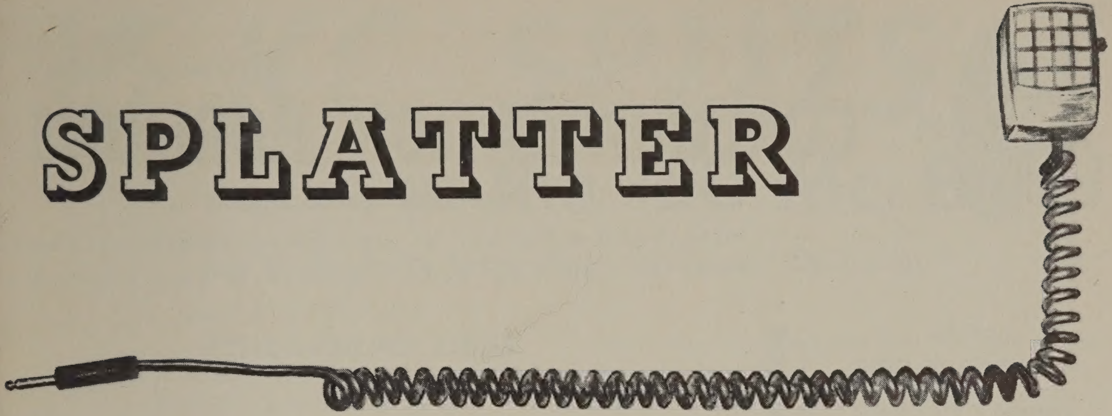

Editorial Notes from Communication Horizons Editor ROBERT B. COOPER, Jr., K6EDX

THE FCC RESPONSIBILITY

Americans have heard a great deal of high echelon talk of late about "public responsibility" on the part of the broadcast industry. Various FCC officials have been heard to remind the nation's commerical airwave licensees "of their obligation to the public in filling a portion of the nation's radio spectrum."

On the surface we are delighted to see such interest being displayed on behalf of the public interest! However further down than the surface, we are once again annoyed by what certainly must be considered to be an "oversight" on the part of the *Federal Communication Commission's* policy makers.

Our annoyment stems from both public attitude and official reaction to this attitude. The whole industry is aware that the regulation of broadcasting (radio and TV) is NOT the only function at the FCC. Unfortunately, we feel, the Commission apparently *is not* so aware of this fact. Whenever the subject of broadcasting (meaning any form of radio or television, industrial, commercial, private or otherwise) comes up in Washington Congressional circles, the topic immediately centers on commercial broadcasting. Quite frankly, we would be very surprised to learn that any sizeable percentage of this nation's Senators or Representatives have even the smallest smidgen of knowledge of the very-very large amount of capital tied up in two-way communications equipment *within their own districts.* We would not be at all surprised to see a study (although to the best of our knowledge none has ever been prepared) revealing that for every dollar invested in *commercial broadcasting equipment* in any given area, ten times that amount is tied up in two-way radio equipment.

And yet for more than a decade of explosive growth our two-way field has received only token interest from the seven FCC Commissioners who sit in the control seat for all of this nation's communications.

To give praise where praise is due, we are entirely satisfied (under the circumstances) with the job being performed by FCC department heads who specialize in the various two-way fields. BUT . . . we believe time is overdue for a comprehensive study of the entire two-way field by a *Commissioner level study group.* We are out of frequencies, we have "split" until we can split no more. And still the demand for two-way communications continues to grow at a logarithmic rate.

It is high time the "new frontier" took a good—hard look at the entire communications' industry. Had it been done *yesterday,* the problem might have been nipped in the bud. If it is not done until *tomorrow,* the solution to our problems will be twice as difficult as they are *today. And today is already too late.*

R.B.C.

OUR COVER . . .

Credit for this month's exceedingly impressive cover goes to the *Andrew Corporation,* Chicago, Illinois, manufacturer of antennas, antenna systems and transmission lines. When the CH editorial staff saw this masterpiece on Andrew's new Catalog M the wheels began to spin to secure *Andrew* permission to duplicate the work here.

Special thanks go to Ernest Heitsch at Andrew for his airmail—special delivery action in supplying CH with the necessary artwork.

For the unwary, the cover depicts a "quad-array" of parabolic dishes for the microwave region, and a "Smith Chart," commonly used by antenna manufacturers in plotting the gain, pattern and loss factors for any number of communication type arrays.

R.B.C.

JULY 1961
VOLUME 1 • NUMBER 2

COMMUNICATION HORIZONS

and **"Two-Way Radio Digest"**

PUBLISHED MONTHLY BY HORIZONS PUBLICATIONS
POST OFFICE BOX 3206 • MODESTO, CALIFORNIA

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ADVERTISING

Communication Horizons Magazine accepts commercial display advertising from bona fide manufacturers and distributors of communications equipment and associated apparatus. Advertising rate card and coverage data available upon request.

Eastern-Midwest Advertising Representative
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300 West 43rd Street
New York 36, New York
JUdson 2-4460
Dick Cowan, WA2LRO
Jack Schneider, WA2FPE

CIRCULATION

Communication Horizons Magazine is read monthly by nearly 10,000 two-way communication engineers, technicians, salesmen, installers and users. Detailed circulation breakdown available upon request.

SUBSCRIPTION

Subscription rates in the United States, Canada—$4.00 per year. Single copies not available. Subscriptions outside the U.S.A. and Canada — $5.00 per year. Subscription remittances should be made by bank draft or postal money order.

Airmail subscription available at $7.00 per year, U.S. and Canada.

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COMMUNICATION HORIZONS (title registered U.S. Post Office) entered as second-class postage material May 20, 1961. Second-class postage pending at Modesto, California.

POSTMASTER: Send Form 3579 to Communication Horizons, P. O. Box 3206, Modesto, California.

Communication Horizons' readers—always the first to know, the best informed, the first to act."

15 KC SPLITS

in the 150 Mc. Band

Are 15 Kc. Splits Better Than Co-Channel Operation?

Paper Originally Prepared by

J. A. McCormick
Communications Products Department
General Electric Company
Lynchburg, Virginia

(part one)

The major problem facing the mobile radio industry continues to be *"finding enough radio frequency channels"* to accomodate all the applicants who need and desire mobile radio facilities. User groups and industry spokesmen have kept the FCC well informed on our needs for additional spectrum space, and we believe they have earnestly tried to fullfill them, but it will always be incumbent upon the users to make the maximum possible use of the spectrum space we have. Historically, the Land-Mobile Services have made very judicious use of this important national resource. Channel splitting is a fine example of more effective utilization of the spectrum. A further move in this direction is undoubtedly the implementation of further 15 kc splits, — the so-called tertiary frequencies in the high-band.

We are suffering real channel congestion right now. In metropolitan areas the business radio channels, for example, are loaded about 10 systems deep and this explains why tone squelch systems are finding increasing application. Tone squelch systems are a panacea but they cannot replace the communication effectiveness of a clear radio channel. Tone devices simply prevent you from hearing other systems on the frequency, they do not provide air time when the other fellow is using the channel nor do they prevent capture of the frequency by a powerful signal.

With so many systems on any one frequency, the channel congestion becomes almost intolerable. In addition, it has the serious effect of reducing the Mobile-to-station range to as little as a few miles. This occurs because the Mobile units of one system have to compete with the powerful base transmitters of other systems in order to be heard. This brings up the point that not only should we consider the early implementation of the use of the tertiary frequencies, but we should also consider the more wide spread use of two-frequency Mobile systems, wherein a portion of the available frequencies are reserved for Mobile use only so that Mobiles will not have to compete with base transmitters. The taxi-cab industry is a classic example of the high traffic handling capacity of two-frequency systems under very congested metropolitan conditions. Without two-frequency operation, it would not have been possible for taxi-cab radio to do the job it did in the days when only four channels were available to any area, — large city or small. The success of taxi radio operations points up the desirability of considering reservation of some of the tertiary frequencies for Mobile use only. This is a means by which some of the present interference in metropolitan areas could be alleviated.

The specific questions we would like to consider in this paper are these: Just how satisfactory are the tertiary frequencies? Is it better to choose a tertiary frequency or to share a channel with one or more systems? We have considered these questions from both a laboratory and a practical operation standpoint, and are pleased to report on our findings.

One of our affiliated Sales and Service Agencies, *Communications Engineering Company* of Dallas, Texas, has installed what we believe was the first industrial system placed in operation on a tertiary frequency, the *Go-Crete Ready-Mix Concrete Company* of Dallas and Arlington, Texas. The Go-Crete system has been in and working since November, 1959 and engineers of both CECO and General Electric have conducted field surveys, independently, to determine the degree of interference which would occur between that and systems 15 kc. removed on each side of its operating frequency. We might add at this point that the Go-Crete system uses no form of tone protection.

Before discussing the Go-Crete tests and the results of those tests, we would like to show a series of curves which will show the engineering considerations of operation on 15 kc. splits.

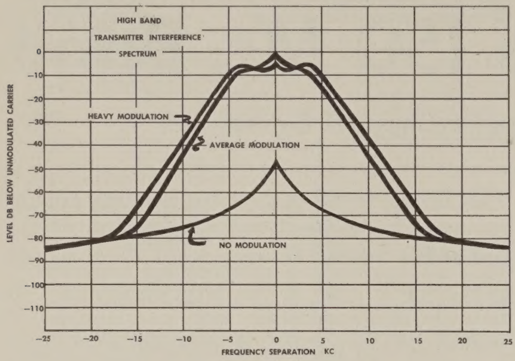


Figure 1

Figure 1 shows the spectrum of energy radiated by a transmitter which meets the FCC narrow band standards, under three conditions of modulation; that is, no modulation, average modulation, (which is voice modulation just below the limiting level), and heavy modulation, (which is voice modulation sufficiently heavy to result in 10 db of limiting). These curves show that, when a transmitter is voice modulated plus and minus 5 kc., the radiated energy will be fairly flat out to the plus and minus 5 kc. points and then trail off at about a 6 db per kc. rate. The slope of the transmitter side-band envelope determines the slope of the receiver selectivity curve that will be useful. The skirt of the receiver curve should be slightly steeper than that of the transmitter envelope. With a transmitter slope of 6 db per kc., a receiver selectivity slope of more than 10 db per kc. would not provide improved interference rejection.

It can be seen the transmitter side-band envelope is the limiting factor in channel spacings of 15 kc. If we assume receivers with a pass-band of 10 kc., centered at the 15 kc. points on each side of zero frequency, we observe that a considerable amount of energy falls into the pass-band of those receivers from such an interfering transmitter. Therefore, the only way to avoid interference is to provide sufficient geographic spacing so the unwanted energy is sufficiently attenuated. We cannot of course, expect a receiver to reject energy that falls directly in its pass-band.

When the transmitter is unmodulated, the carrier is a spike whose maximum amplitude is zero db as shown on the ordinate of the graph. The noise spectrum starts at 46 db down and trails off to about 80 db at the 15 kc. points. *In 30 kc.* channel spacing, the transmitter modulation envelope is not the limiting item in adjacent channel operation. *The limiting item is the noise spectrum of the offending transmitter.*

Figure two shows the true selectivity of two types of receivers that were used in the Go-Crete tests. The 100 db. specification usually associated with the so-called 20 db quieting method of measuring selectivity will not be found on these curves. The 20 db quieting method of measuring selectivity is often false because it ignores the desensitizing effect of a strong off-channel signal. Only a single signal is used in that method. These curves were plotted on the basis of 6 db degradation of a 12 db sinad ratio resulting from the application of an unmodulated interfering signal. The sensitivity of the receivers is approximately half a microvolt for a 12 db sinad at the output. The curves show that a quarter of a microvolt of undersired carrier at zero frequency, (the frequency to which the receiver is tuned), will degrade the 12 db. sinad, 6 db. As we move off resonance 15 kc. we see that approximately 50 microvolts of undersired carrier is required to degrade receiver B to that degree and more than 5,000 microvolts for receiver A. At 30 kc. off resonance — the adjacent channel — both of these receivers exhibit greater than 90 db rejection.

The standard EIA two-signal method of measuring selectivity uses modulated signals for both the desired and undesired signals. However, in these curves no modulation was used on the interfering signal generator in order to plot a selectivity curve that could be used as a pattern against the transmitter side-band envelope to determine the points at which interference would occur. As mentioned above, these curves, at the 15 kc.

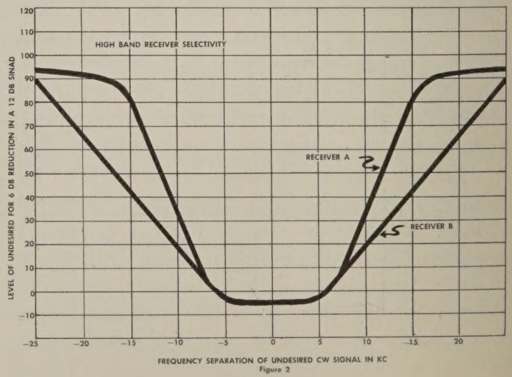


Figure 2

points in which we are particularly interested, show 42 db rejection for receiver B and 82 db rejection for receiver A. Standard EIA curves would show receiver B to have 24 db attenuation and receiver A, 48 db attenuation. In other words, the effect of using a modulated signal for the interference would be to displace the curves about 3.3 kc. due to the modulation.

Note that the slope of the selectivity curve of receiver B is approximately five db per kc. while of receiver A it is ten db per kc. Our examination of a transmitter side-band envelope indicated that it would be desirable for a receiver to have a steeper slope than that of receiver B, and this proved to be the case in the Go-Crete Tests, although receiver B gave a good account of itself under these very adverse conditions.

Figure three shows the interference situation by combining the selectivity curve of receiver A with the transmitter spectrum under conditions of average modulation and no modulation, when transmitters and receivers are exactly on frequency. A second set of transmitter curves shows the conditions prevailing when they are moved one and one-half kc. closer to the receiver frequency. This would be the condition when the transmitter and receiver are at the limit of 0.0005 percent tolerance.

Interference will occur where the transmitter and receiver curves intercept. Looking first at the transmitter curves which depict exact frequency operation, it will be seen that the noise spectrum of the unmodulated transmitter first starts to enter the receiver pass-band when the interfering transmitter is seventy-two db stronger than it would need to be to cause interference on the frequency to which the receiver is tuned. In other words, by offsetting the interfering transmitter fifteen kc., we obtain seventy-two db increased protection against interference. With modulation on the interfering signal however, we have a situation shown at left where the protection is only thirty-six db greater than co-channel. As mentioned earlier it will be seen that the voice modulation starts to intercept the receiver pass-band at the thirty-six db

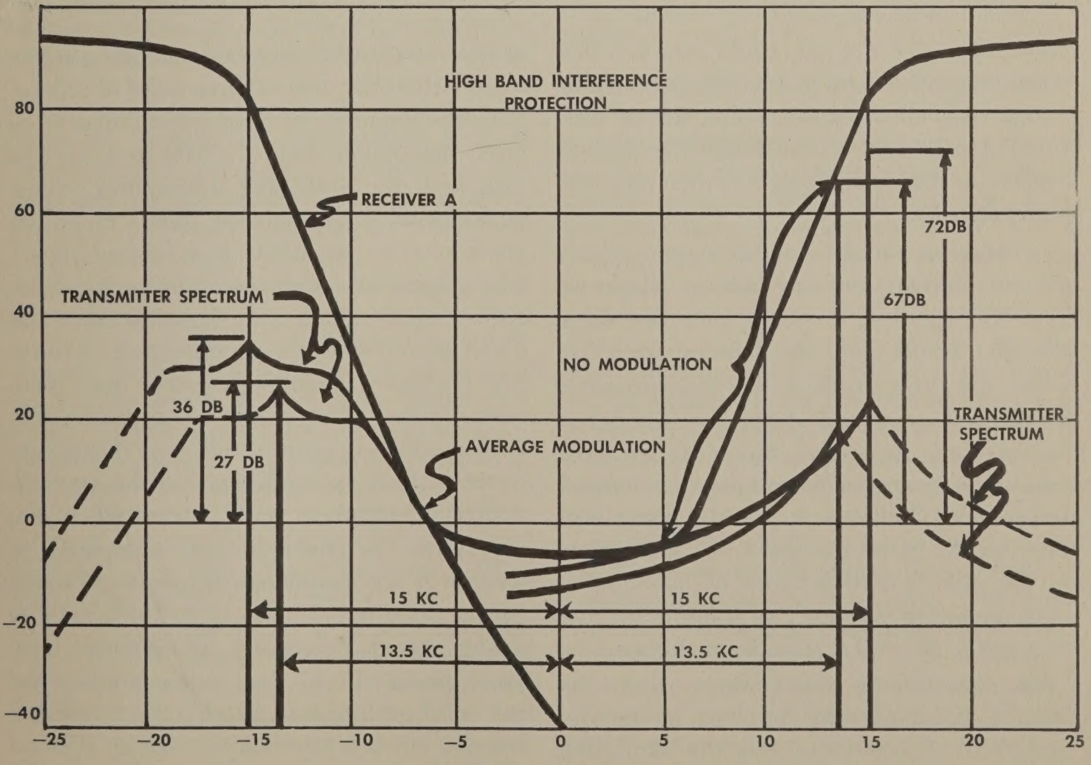


Figure 3

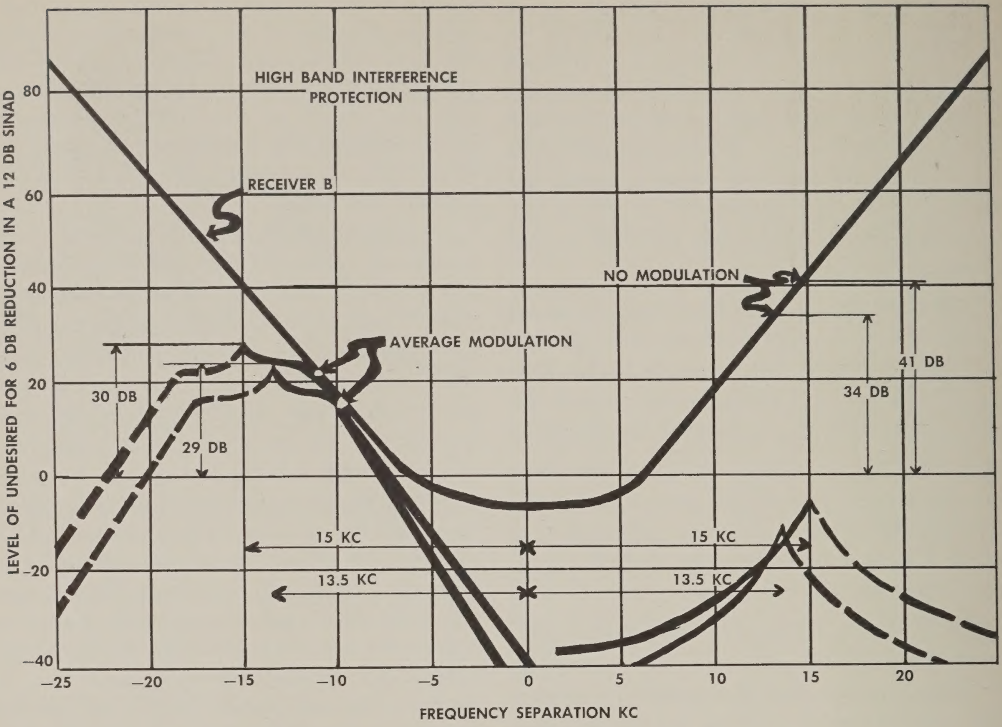


Figure 4

point. The only way we could improve this situation woud be to reduce the nose width or pass-band of the receiver and this in turn would require that we modulate the desired transmitter correspondingly less than plus and minus five kc.

Looking at the transmitter curves which are only thirteen and one half kc. displaced from the receiver, we note that the noise spectrum is not now the limiting item but rather, the carrier spike which starts to enter the receiver pass-band at a point sixty-seven db above the zero level. Similarly, we have less attenuation of the modulated undesired transmitter. Our rejection has fallen from thirty-six db. to twenty-seven db. This points up the increased importance of maintaining exact operating frequency of transmitters and receivers in fifteen kc. split-channel operation.

The interference relationships shown by this set of curves were born out in the Go-Crete tests. It was found that the interfering carrier produced no interference until our test vehicle was very close to the offending transmitter. However, one to three miles of separation was required to avoid interference from voice modulation peaks. As the test car approached the offending transmitter, voice peaks could cause squelch bursts in/or degrade receiver sensitivity to a desired signal. The degree of interference shown by these curves varies all the way from twenty-seven db to seventy-two db, — a difference of forty-five db. Since radio propagation over plain earth drops off at a rate of approximately twelve db per octave, this would indicate about a ten to one difference in the range in which interference could occur when the transmitter is modulated, as compared to when it is not modulated. If one encountered carrier noise interference at 0.4 of a mile he could expect detectable interference from voice peaks out to four miles. Fortunately, the voice peak type of interference is not destructive nor is it especially annoying. It could

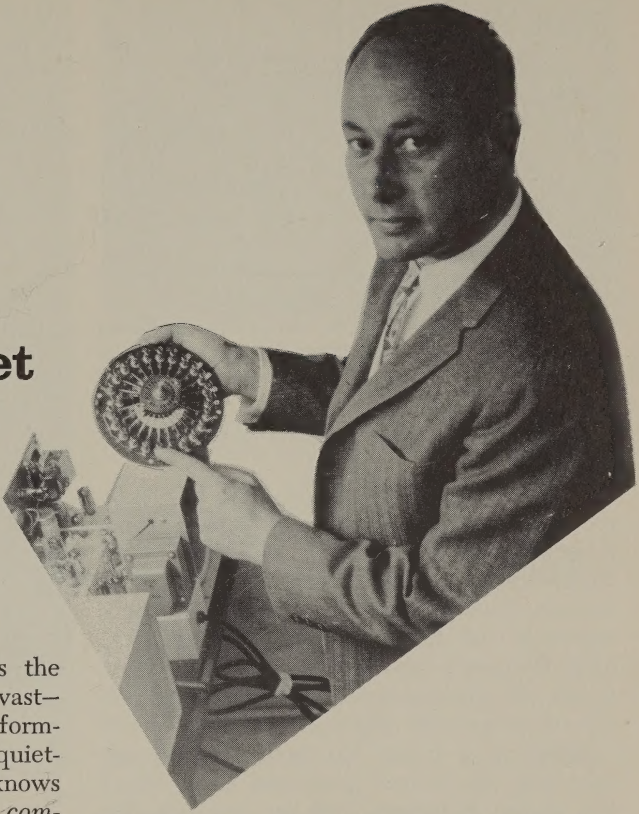
(Continued on page 9)

INDUSTRY PORTRAIT

a series

"The Real Secret is the Oven"

Cushman Electronics
1034 W. Evelyn Avenue
Sunnyvale, California



ROY CUSHMAN and his precision Crystal Switching Base Assembly.

In Sunnyvale, California these days the nucleus of what may one day become a vast—far reaching test equipment empire is forming. Spearheading the movement is a quiet-mannered electronics engineer who knows only one creed; *"Today's VHF-UHF communication's world depends upon accurate-precise right-on-the-nose frequency operation."*

His name is Roy Cushman and he believes his product, the CUSHMAN MCM-5 Multi-Channel Frequency Monitor, is the very best on the market today for insuring precision frequency operation in VHF and UHF communication systems.

That the MCM-5 is unusual in design and precision in production is an accepted fact. One of Cushman's favorite selling points (usually displayed as the customer is waivering on the point of placing his order) includes a one foot air-to-floor drop of the unit. He simply picks it up (operating), raises it and drops it. All $1,365.00 of meter.

The customer, after recovering from his initial shock, quickly notes the frequency has changed not a cycle. And Cushman, smiling a bit, pulls out his order book.

But despite the MCM-5's ability to withstand physical shock (One customer told CH *"sure the demonstration was impressive, but how often do I knock the meter off the test bench!"*) Cushman tends to believe the real secret for his unit's success is the carefully designed and precision formed "crystal-oven." The oven is a thing of electronic beauty. Up to twenty-three crystals are accommodated in the cylindrical configuration which is coated with one-half inch type B fiberglas insulation. Cushman points out *"this is roughly equal to six inches of standard rock-wool insulation as found in most homes."* The machined oven contains two heat-windings. The first is a fast heat affair which raises the unit's operating temperature to 151 degrees F. The second nudges the heating process up to the operating temperature, 167 degrees F. A specially designed mercury column thermostat keeps the inside oven temperature to within a fraction of a degree at 167 F.

Heating the special cylinder oven is accomplished by an AC voltage flowing through a resistance wire which, in turn, is insulated from the oven by 3,000 volt milar insulation.

As shown in a photo the back cover plate on the oven includes a rotating disc which allows the operator to make minor trimmer adjustments on any of the twenty-three crystal positions without removing the oven back-

INLAND WATERWAY RADIO SERVICING

Is your shop miles, perhaps hundreds of miles from the nearest body of water?

Does the dust of the land blow incessantly past the doorway of your domicile?

Fine! You, Sir, are precisely the gentleman to whom this article is directed. The Editors of CH have discovered that many two-way radio servicemen are losing hours of business, and uncounted dollars per week in profit because it has not occurred to them that a large percentage of the boats which they see daily contain two-way radio gear.

"Swell," you say, "However I don't see anything but the grimy undersides of the dashboards of well-used Chevrolet Apaches."

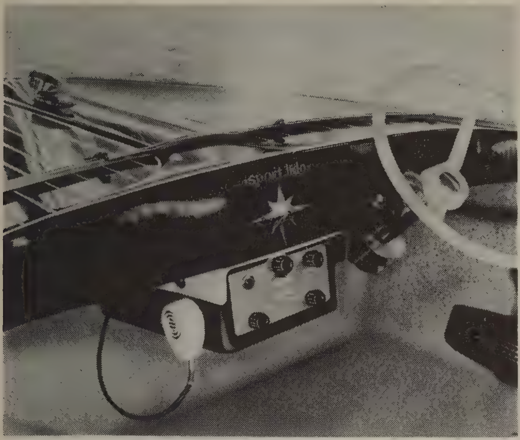
OK, haul yourself out from under those dashboards and have a look at the biggest potential service market growth for Two-Way Radio servicemen since the invention of the Fleming Valve.

This potential lies, of course, in the field of servicing radio gear for pleasure craft.

Prior to World War II, the ownership of yachts, cruisers, speedboats, et al., was considered to lie wholly within the province of the very rich. Since the war, however, with the tremendous expansion of the U.S. economy, the pleasure craft business has grown to become a multi-billion dollar industry. Contributing to this is the fact that Uncle Sam has created, for the purpose of water conservation and power generation, dozens of large new lakes and reservoirs all across the United States.

An indication of the magnitude of the growth of inland water sports is perhaps provided by the fact that the U. S. Coast Guard today patrols many of the larger natural and man-made lakes. It is a fact that there are today several *million* privately owned pleasure craft in the United States. Of course, not all of these utilize the advantages of two-way radio equipment. Many, however, do, and the affect of this on the business of the communications equipment serviceman should be obvious.

Let us examine, for instance, the growth of



This could be the new look for you.

a certain western service organization since the creation, by the Army Engineers, of a large reservoir some forty miles from its locale. Until the construction of the reservoir, this company's business had been devoted entirely to the usual installation and maintenance of mobile gear for building contractors and the like. Then, one day, the owner of the organization, a particularly perspacacious and singularly serendipidous individual, noting that several of his friends were purchasing and operating small boats of various descriptions, took advantage of his observation, and today no less than thirty per cent of his business is devoted to the servicing of marine mobile gear.

Sound good?

"How then," you may ask, "can one get in on the gravy?"

Simple. There are actually a variety of inroads. First, and probably most obvious, you should establish a liason with the small boat dealers in your area. Secondly, contact the local boating clubs. A third idea, useful in gauging the amount of activity in your area, is simply this: Monitor the marine channels some weekend. See what shakes.

There you have, friend, a simple, succinct suggestion for significant supplementation of your income. In short, get out from under those grimy truck dashboards. Get under a grimy runaboat dashboard. R.S.

". . . and so Communication Horizons came along, and we didn't subscribe, and we kind of got behind with things, and I guess you know the rest."

CB SERVICING - *Is it worth the trouble?*

by Rick P. Stauduhar, K6ERG

Most commercial two-way radio shops have been approached by CBers (Citizens Radio users) who want work done on their transceivers. Many shops give the CBer a pleasant "brush-off," and there are some who just give the guy "the bums' rush." Still others *do* consent to work on the rig.

Because of the rapid growth of the CB service (the FCC just issued its 200,000th license – each license covering at least two units, but some with authorizations for as many as 10) we felt that it was time for CH to take a look at the question of whether servicing CB equipment was a worthwhile venture for a commercial two-way service shop. We'll look at the pros and cons and take a look at the market potential. Of course, the decision is up to the individual shop, but we will attempt to give you the facts with which to work.

The CB service was skyrocketed to national importance in late 1958. Within a few months there were a score of manufacturers trying to keep up with the growing market. Today, according to the Marketing Director of one of the largest and most famous CB manufacturers, the market supports almost 200 manufacturers, and brings in about $10,200,000.00 per year. Next year the estimate is for a $16,000,000.00 dollar volume. License applications have been pouring into the FCC at a rate of about 13,000 per month right now, and there has been a fairly steady flow of them at this rate for about eighteen months.

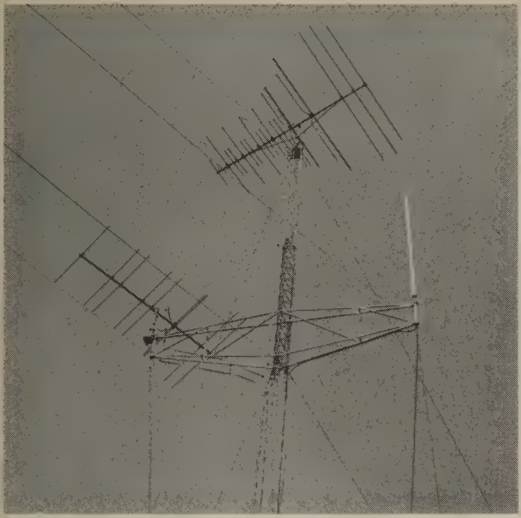
What it boils right down to is the fact that there are, right this very minute, about 800,000 transceivers on the hoof, with the prospect of at least a million by the end of the year, according to the (conservative) Marketing Director.

Who are CBers? Well if you haven't seen one in the flesh yet we'll try to describe the species. A large percentage of them are non-technical people who want to press a button and get a message from one side of town to the other either for commercial or personal purposes. There are some hobbists who perform "ham" type operations, in violation of Part 19 of the FCC "Bible." You'll find that a very large percentage of these people have accumulated a smattering of electronics knowledge and come on big with superficial quasi-technical lingo. They are interested in the inner workings of their rigs; they know what crystals are, they know that there are such things as SWR, transmission line losses, over-modulation, under-modulation and weak tubes to think about in getting the *best* coverage – which they all want. Unfortunately, many have fallen prey to "screwdriver technicians" who have persuaded the innocent CBer to turn over his rig, for a small fee sometimes, for "souping up and retuning." The purpose, of course, is to give the station the legendary and fabled "*best* signal on the band." The general work done by these unlicensed tinkerers is consistently poor and consists mainly of shorting out a resistor in the grid circuit of the final to drizzle out an extra watt or two. More often than not the modulation circuit will not be touched and the guy winds up with a poorer signal than he had before due to weak modulation. There is also the possibility that the unit will be peaked to the point where it pulls out of the .005 percent frequency tolerance.

This is generally when the guy decides to show up at the 2-way service shop with his mangled tubes and transformers pleading, "Please help me get this thing working right again." It is not uncommon for the serviceman to take one peek beneath the chassis cover and mutter (between clenched teeth), "I'm sorry we're too busy to bother with this kind of work."

Is that you? If it is, *are you really too busy –or are you afraid of "crossing the border?"* The border? The border is the same one a doctor faces when he has specialized in brain surgery (or whatever) for thirty years and all of a sudden someone shows up in his office with an ingrown eyelash–someone with not too much money yet – and who expects a five minute miracle at a bargain price. It's not very encouraging, we'll admit, however would you be interested if he told you that he knows where there are a million other broken eyelashes to be fixed?

This puzzled us too so we took some trips around to a number of two-way shops and came up with some viewpoints.



SIMPLE — BUT EFFECTIVE ANTENNAS keep the small town service shop perking on all four cylinders, TV, FM, two-way and CB.

Surprisingly enough, a big complaint about the CBers was the shop owners' fear that their place will become headquarters for all the budding Marconi's in the area to sit around and chew the fat, boning up for ham tickets and getting thumbprints on the 807s.

Another squawk was that, *"These guys want you to put three hours worth of time into their sets and not charge them for it. They think that just because they're 'one of the two-way fraternity' we owe them the courtesy of free diagnosis. If you check a frequency for one guy, the next day he shows up with eighteen buddies who want similar service — while they wait."*

We asked what the most common rig problems were and found out that the CBers were concerned with too little output, too little modulation, poor sensitivity, poor squelch, and ineffective noise limiting. A good percentage of these complaints, of course, were imaginary — the result of another operator's bragging about how good his own rig was.

Some operators did actually request the shops to boost their rig's input over the allowable five watts.

In our survey we stopped off in a small centrally located town where the local two-way shop also works on TV sets, radios and phonographs. This fellow wasn't particular where his money came from and gladly worked on any and all CB rigs. We figured he was about our best bet to get the full story on what actually goes on in CB circles.

He told us that he carried a line of CB rigs for sale to the local populous but was "forced" to purchase two sets from the manufacturer for this privilege of dealership. This was an investment of about $300.00 in rigs, plus CB antennas. That was about "it," except for a few sets of inexpensive crystals. Transmission line, tubes, mikes, etc., were common to his regular two-way business and were incidental. Investment in test equipment was nil since it had been in the shop long before *"CB was a gleam in the FCC's eye,"* as he put it.

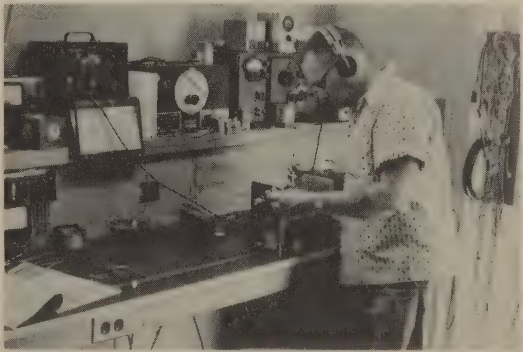
He didn't really mind the CBers in his shop — true they turned the knobs on his freq meter and once blew the fuses while experimenting at his test bench. But he felt that his was really no great nuisance. He had even gone so far as to have contacted the local CB club (yes, they have clubs) to offer to check frequencies at a group rate. He felt that his was good community publicity and service.

In conjuction with the local CB club, he had placed a small ad in their monthly news bulletin. *"It cost about 5 dollars, but it put me in solid with the boys. I also give them technical advice on their articles."*

We asked him if his CB activities irked any of his two-way customers. He told us that he had originally thought it would but it didn't seem to make much difference.

"After all, CB really isn't in competition to commercial two-way radio. CB is not anywhere near to two-way's class and I don't think it ever could be. It fills the need of the people who would never go into two-way in the first place," he said.

He told us that since CB came along, the additional income *("It's not much on an individual basis, I'll admit, but it sure adds up to a tidy sum at the end of the year.")* had been acquired with less investment than he



POPULAR CB RIG ON THE BENCH was undergoing patch-up work correcting the blunders of the local CBer when CH interviewed the shop owner.

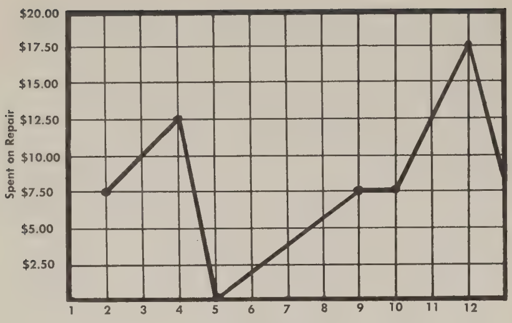


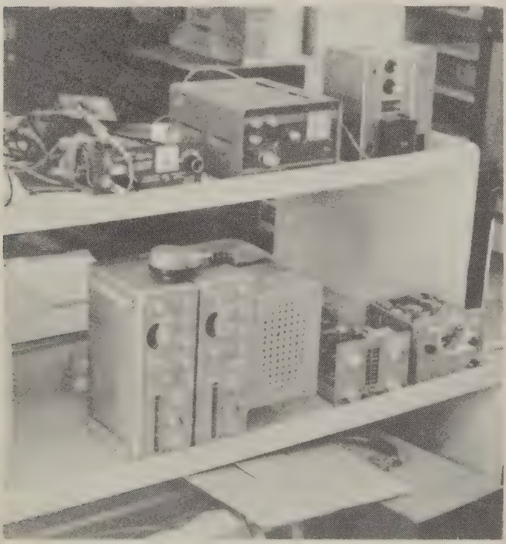
Figure 1

had ever before made when branching out into a new service.

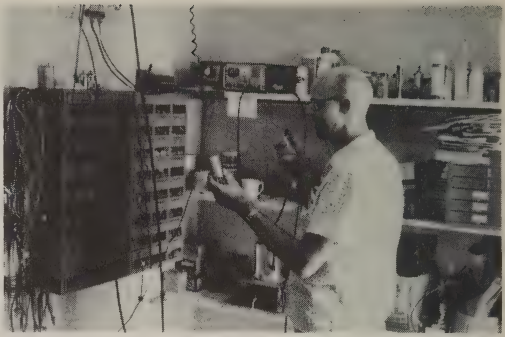
He had a CB transceiver on the air in the shop while we were there and now and then replied to local operators who contacted him about their problems.

He told us that the repairs they requested were relatively simple, not requiring much more work, in most cases, than fixing or replacing a non-relaying relay, a frayed and shorting mike cord, or a noisy squelch pot. Of course, frequency checks were the order of the day most of the time. Antennas had to be put up, transmission lines matched and free advice given in copious doses.

We asked him for a few words of sage advice in parting as we saw that two CBers had just carried into his shop the remains of what looked like a CB rig that had been Osterized.



A LITTLE BIT OF EVERYTHING finds its way to the typical small town service shop work bench. On the top shelf, three CB rigs of varying nomenclature; on the second shelf, a Morrow ham rig and a VHF aircraft radio, all part of the service work done by the small shop operator.



"I PUT UP WITH A LOT" the small shop operator told CH. Here the shop owner runs an aircheck with a local CBer who wanted to know if he had "vibrator hash." He did not; his coaxial connection was dirty!

He said, *"If a two-way shop has a full work load then they certainly don't need CB. In fact, they'd probably never forgive themselves for taking the badly needed time away from their two-way customers—who are after all the regular steady customers. You might not see any single CBer more than once or twice, they're a pretty itinerant bunch.*

"On the other hand if a shop does have the time and a little patience they can surely put their already warmed-up equipment and salaried personnel to better "slow-time" use than monitoring a ball game. CB is a natural for a shop which needs to fill "dead" time.

"I figure the money I'm making on CB today is a drop in the bucket compared to what I can make in a few years if I keep cultivating the market.

"I'm not too proud to accept business, that

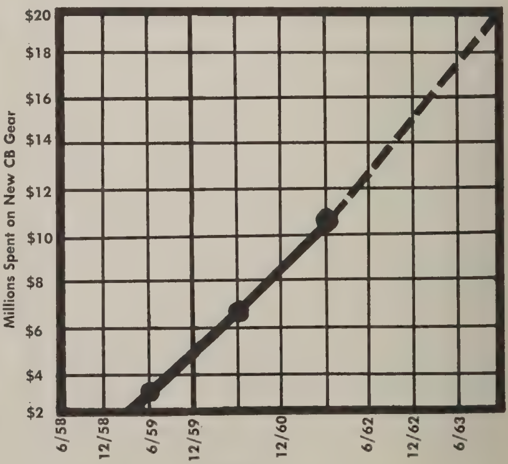


Figure 2

(Continued on page 25)

NEWS BRIEFS

FIRE RADIO SERVICE

154.265 and 154.295 "out of reserve"

In response to a joint request of the International Municipal Signal Association and the International Association of Fire Chiefs, the FCC has released rule proposals which would define a fire radio service "system" as including all licensees in a given area such as a state, county or fire district who coordinate their frequency usage so as to be eligible for a common frequency with "inter-system" frequencies being used for communication between such systems.

The rule proposal also poses additional "inter-system" frequencies for the fire service . . . 154.265 and 154.295 mc. Comments are due at the Commission by August 1.

AUGUST IS VACATION TIME

Commission to go "inactive"

Following an "annual practice," the FCC will schedule no hearings or oral arguments during the month of August, and will meet only once during the month, on Tuesday, August 1.

MARITIME CONELRAD

The FCC has announced a proposed rule making which would bring stations in the international fixed public radio communications services and land to shipboard radio stations in the maritime services (parts 7 and 8) under the Conelrad rules and regulations. Comments are due on the proposal by July 14.

FCC SAFETY—SPECIAL SERVICES IN MAY

Processing time going up!

Business and Citizens Radio Service license processing time increased during May due to "procedural changes" at the Commission level. However the Commission notes that by mid-June they expected to have a "modified version" of the proceeding line in action which would "ultimately speed-up" processing time for all types of license applications.

The Commission explains the following processing times reflect the number days from receipt of an application in "good order" for routine processing to the time the completed authorization is put into the mail to the licensee. They do not, therefore, include the time required for the application to reach the Commission from the time of mailing, or the time taken by the authorization to reach the applicant after mailing from the Commission.

SERVICE	APPLICATIONS RECEIVED			APPROXIMATE PROCESSING TIME (in days)		
	Mar.	Apr.	May	Mar.	Apr.	May
Business	1,610	1,181	1,605	35	45	52
Other Industrial	2,106	1,750	2,120	45	39	36
Land Transportation	667	1,750	2,120	15	25	23
Public Safety	1,621	1,171	1,571	11	19	21
Citizens	15,610	13,937	13,304	43	54	71

NPRFCA-API COMMITTEE MEETING IN WASHINGTON

Despite a report from the Electronic Industries Association expressing that group's view that EIA standards for tone coded squelch devices used in two-way mobile communications systems should include no more than a "general requirement" for "some convenient means of monitoring," representatives of the petroleum industry in June appeared to be girding for further activity in an attempt to bring about more effective monitoring procedures with such equipment in the petroleum radio service.

The EIA report, submitted by Robert Peth, chief Engineer, Mobile & Portable Products, for the Motorola Communications Division, was one of the high points of interest early in a three-day petroleum communications meeting June 6-8 in Washington.

The first of the three-day session, and part of the second, was occupied by the annual meeting of the National Petroleum Radio Frequency Coordinating Association, while the remainder of the meeting was the semi-annual session of the American Petroleum Institute's Central Committee on Communication Facilities.

Reelected as officers of NPRFCA in that organization's meeting were Chairman Ray L. Ransome, Shell Communications, Inc., Houston, Tex.; Vice Chairman Waldo Shipman, Columbia Gas System Service Corp., New York City; and Secretary R. P. Jones, of the Standard Oil Co. of California, San Francisco.

Mr. Ransome, in his report as Chairman of the Association, summarized regional coordinators' reports showing a net increase of 3,666 new petroleum radio installations for which NPRFCA frequency recommendations were made during the past year. The 7.5 percent increase, he reported, reflects a June, 1961, total of 52,440 petroleum radio units.

PRIVATE MICROWAVE -

Where is it today . . . and Where is it going?

Paper submitted by the EIA June 1, 1961 to the State Department "Panel of Expert Advisory Committee." COMMUNICATION HORIZONS thanks the EIA and the Department of State for their permission to run this report "en totale."

R.B.C.

In response to the request of the Panel of Experts Advisory Committee for information on the present status of and future plans for private microwave in this country, the Electronic Industries Association (EIA) has conducted a survey with the assistance of the Central Commitee on Communication Facilities of the American Petroleum Institute (API), National Committee for Utilities Radio (NCUR), Associated Police Communication Officers, Inc. (APCO), and the Association of American Railroads (AAR), as assigned by the State Department as *"Contributing Agencies"* in the preparation of this report. The assistance provided by the hundreds of present and prospective users of microwave radio in private systems, in answering the questionnaires, is gratefully acknowledged.

One of the early successsful uses of the radio spectrum was to supplement the ever-increasing demands for point-to-point communications. In those countries without adequate wire circuits, radio became the main back-bone for intranational communication facilities and provided a new means for hurdling transoceanic barriers. Development was first in the lower portion of the spectrum and then moved higher in frequency as equipment and techniques permitted. However, a natural barrier was reached at about thirty mc. for extended range point-to-point circuits due to lack of knowledge on propagation phenomena and unavailability of equipment at higher frequencies.

Demands on the HF portion of the spectrum accelerated the development of new techniques to permit the use of VHF and UHF bands for national and international communications. It was soon realized that VHF and UHF radio relay systems actually offered many advantages not possible via HF systems. Multiple channel capacity, plus greater reliability, were the major advances afforded point-to-point circuits.

As communications beget communications, the continually increasing demands on HF bands, plus the ever expanding requirements for larger capacity circuits, have stimulated the user to look ever higher in the spectrum to satisfy his needs.

In the United States, where point-to-point communications are restricted primarily to microwave frequencies, private communication users have developed the bands above 952 mc. to provide economic broad-band circuits of lengths comparable to many HF and VHF facilities. Since 1949, private microwave systems have become the principal means for internal communications in a growing number of industries. Its performance, in terms of reliability, flexibility, and cost, has surpassed the fondest hopes of its early adherents. The demonstrated ability of microwave systems to solve private communication problems has resulted in a steadily increasing number of systems in operation. This extensive use of private microwave has developed in a healthy "laissez faire" environment in the United States, although this country has the best communication common carrier facilities of any country in the world. Free enterprise in a competitive atmosphere has developed the microwave spectrum to the extent that HF and VHF no longer considered necessary for long-range, high-density circuits in this country.

This report will review the results of this comprehensive survey and provide significant figures. This will be followed by an evaluation of microwave and high frequency radio as applied to private systems.

PRESENT SYSTEMS

EIA mailed questionnaires to approximately 350 users of private microwave systems and received 117 replies covering 308 separate systems. The survey is considered to cover the majority of the systems licensed today.

Extent

Those systems represented by actual reply in the survey cover 2,506 hops and 63,722 route miles, giving an average of 25.4 miles per hop. The average system surveyed is 207 miles long and consists of eight hops. (It should be pointed out that systems very in length from one hop to more than sixty hops in tandem.)

Type

The EIA survey covered the frequency bands currently allocated by the FCC for licensing private microwave systems. The percentage of users in each band is as follows:

952- 960 Mc.	36.3%
1850-1990 Mc.	31.6%
2110-2200 Mc.	
2450-2500 Mc.	
2500-2700 Mc.	
6575-6875 Mc.	32.1%

The 952-960 mc. band is used extensively for low-channel, short-haul systems, especially in control systems for VHF mobile radio. While representing a large number of systems, it accounts for a considerably smaller percentage of the communication capacity. The 2,000 and 6,000 mc. bands have the higher capacity and longer haul systems and serve often as "backbones" for systems with spurs presently in the lower frequency band. No users of 12,000 mc. equipment replied, indicating the newness of that band and the fact that equipment is just now becoming available. Recent FCC actions indicate that 12,000 mc. equipment will be required for new intracity and short spur applications. This should result in a rapid growth of systems in this band.

Application

The survey revealed that a very wide range of industries employ microwave communications systems.

These include:

Aeronautical
Forestry
Manufacturing
Mariné
Motor Carrier
Petroleum
Police
Public Utility
Railroad
Retail and Wholesale
Municipal and State Agencies

These systems carry many types of traffic. The percentage of the systems reported in the survey, which carry the different types of traffic, is shown in Table I.

Table I

Application of Microwave Systems

82% of the systems carry Voice Telephone
78% of the systems carry Mobile Radio Control
59% of the systems carry Control Functions
48% of the systems carry Telemetering
25% of the systems carry Teletype
17% of the systems carry Digital Data
7% of the systems carry Facsimile
1% of the systems carry Closed Circuit TV

It is apparent from this tabulation that most systems are used for a multitude of functions simultaneously.

Capacity

The systems reported in the survey have 2,549 derived channels in use and an installed capacity of 9,641 derived channels, permitting a three-fold expansion without additional transmission equipment. These systems represent about 530,000 channel-miles in oper- present about 530,000 channel-miles in operation and have an ultimate capacity of about 2,000,000 channel-miles. Survey predictions indications indicate that capacity will be reached before 1967. Average loading is about 8.3 channels per systems, with an average capacity of 31.3 channels.

Channel capacity of private systems varies widely, depending on usage, ranging from four or six channels on 960 mc. systems for spurs and VHF control, to 240 or more channels on "backbone" systems. Requirements are constantly increasing and are being met with higher capacity equipments.

Investment and Operating Costs

The investment represented by systems reported (86 percent of replies) is approximately $104,000,000. This includes electronic equipment, outside plant, and real estate. Total annual operating costs (75 percent of replies) including amortization, interest, taxes, and maintenance, are $16,800,000.

FUTURE SYSTEMS

EIA mailed approximately 1,000 questionnaires to the largest manufacturing, distribution, financial, and other business concerns to ascertain their future plans as related to private microwave systems. Approximately one-third of the questionnaires were returned and, of these, approximately one-third had plans to use private microwave within the next decade. The information submitted is not as complete as that developed by present users, but does provide order-of-magnitude growth estimates.

Type

While not specifically covered in the survey, the trend has been toward the higher frequency microwave bands. Significant growth of "backbone" systems in the 6,000 mc. band is anticipated, with spurs and intracity links being in the 12,000 mc band. The growth in the 960 and 2,000 mc bands will probably be somewhat less.

Application

Projected applications of microwave show a continued diversification. The following tabulation summarizes information from companies planning microwave in the next five and ten year period.

Table II

Potential Applications of Microwave

80% of companies now utilize Voice Telephone
66% of companies now utilize Teletype
40% of companies now utilize Mobile Radio Control
30% of companies now utilize Control Functions
26% of companies now utilize Video Relaying
23% of companies now utilize Telemetering
22% of companies now utilize Facsimile
21% of companies now utilize Digital Data Transmission
17% of companies now use Other Applications

Investment

Information supplied by present users indicates a growth of approximately fifteen percent per year for current private microwave licensees.

The growth of new users is difficult to predict, except to say that these new systems will undoubtedly exceed the fifteen percent rate until present demand is satisfied.

MICROWAVE COMMUNICATION SYSTEMS AS A REPLACEMENT FOR HF SYSTEMS, WORLD- WIDE Advantages of Microwave Over HF Channel Capacity.

Once an RF microwave circuit is established between two points, additional communication capacity can be added at nominal cost and almost without limit. Single RF paths can be designed with a bandwidth of twenty-five mc., more than the total bandwidth between 4 and 27.5 mc.

Reliability

Microwave is inherently the most reliable form of long range radio communication. Most private microwave systems realize better than ninety-nine percent reliability per year. For example, it is the method of radio communication used by the power utility industry for such critical and continuous applications as protective relaying and supervisory control of entire electric power systems. Microwave systems operate twenty-four hours per day. They are not subject to long-term propagation anomalies similar to those experienced by HF. The microwave systems engineer has many tools at his command to tailor the facilities to the users' specific demands for reliability. These tools include dc power systems, rf standby equipment, and frequency diversity.

The low maintenance cycle required of microwave systems greatly contributes to their reliability. For example, the transmitter klystron will operate more than 10,000 hours before replacement is necessary. Their failure is gradual, thus permitting accurate prediction of necessary replacement, resulting in practically no outrage of service because of tube failure.

Economics

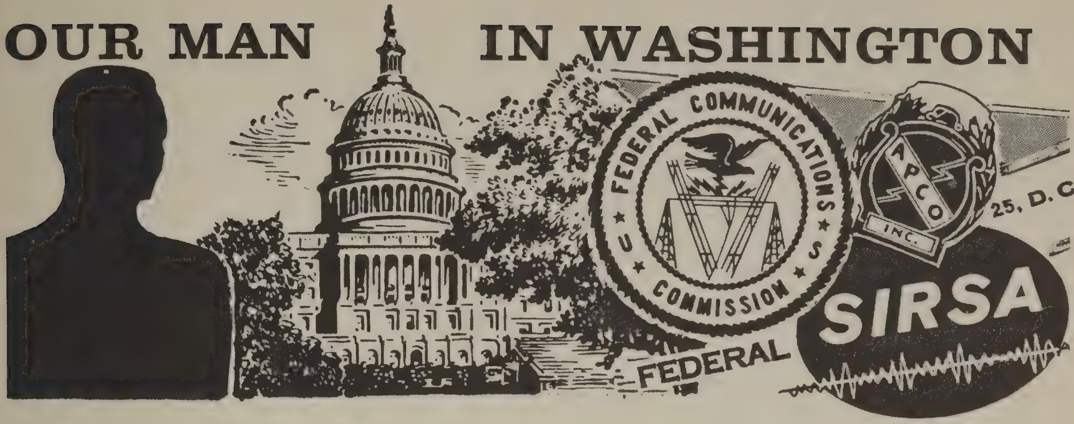
It is very difficult to put a cost figure on a channel mile of an HF circuit. For this reason, microwave will be compared with the cost of a circuit mile of wire line as a standard. The experience of EIA members indicates that, for an average length microwave system, the economic cross-over point between microwave and wire line is about six voice channels. As this is a very low cross-over point, one can understand why microwave has been accepted as the most desirable and economic method of establishing private point-to-point communications in the United States.

Freedom From Interference

Microwave systems use very low RF power (less than 10 watts), highly directional (less than 10 degrees) antenna systems, occupying a minimum of the volume dimension of the spectrum. These characteristic permit the same frequencies to be reused many times throughout the country, without interference between systems. The propagation modes of microwave frequencies are very constant, eliminating the necessity for frequent or periodic frequency changes to maintain a communication circuit. This stability of propagation characteristics in the microwave spectrum permits the engineer to design interference-free systems. Microwave signals are so well confined in range and coverage that, in the United States, call sign and CONELRAD Requirements are normally waived.

(Continued on page 27)

OUR MAN IN WASHINGTON



Manager of Communication Horizons' Washington Office, Robert E. Tall reports on the past month's Communication activities.

SENATE WIRETAPPING BILL PROHIBITS MONITORING

. . . FCC asks changes to protect agency

Two bills now being considered by the senate's Judiciary Subcommittee on Constitutional Rights "would seem to prohibit or at least severely restrict presently authorized radio monitoring by both the FCC and radio licensees who operate on shared channels."

With this analysis in tow the Commission appeared before the subcommittee May 24 and read into record their suggestion for changes in the proposed law.

"As presently drafted, even though it may be unintentional," the Commission said "prohibitions in the bill would appear to affect monitoring of radio transmissions and have a substantial adverse impact on the Commission's regulatory authority over radio communications."

The agency noted "our monitoring program is the ONLY feasible way to supervise the use of the airwaves to insure that radio stations are operating on their assigned frequencies, with authorized power and that the stations are being used for the purpose as intended by their licenses."

The "only serious challenge" that has ever been made to the Commission's monitoring authority occured some five years ago and in this case the U.S. Supreme Court affirmed a lower court ruling that "The Commission could monitor radio communications for the purpose of enforcing the Communications Act."

One of the bills being considered by the subcommittee, the Commission said, might also be considered to prohibit radio monitoring by FCC licensees "in services where frequencies are shared by several users, for instance, in some of the safety and special radio services . . ."

The Commission wound up its appearance before the law making group with a request that both bills be modified in context so as to not endanger the continued operation of both FCC monitoring installations, AND, channel sharing two-way users.

RELAXED FREQ. COORDINATION RULES ADOPTED

. . . Split Channel services included

The FCC has adopted an amendment to its rules to permit applications for certain "split channels" in the police, fire, forestry conservation and highway maintenance radio services to use provisions of section 10 of the rules which generally relax frequency coordination requirements.

Petitions had been recieved from the Associated Police Communications Officers, the International Municipal Signal Association, and the International Association of Fire Chiefs . . . in a joint filing . . . and from the Forestry-Conservation Communications Association all of whom sought substantially similar amendments to those parts of part 10 of the Commission's rules applicable to their respective services.

The amendment approved by the Commission provides that applicants in the services mentioned for "split channel" frequencies (i.e. channels located either fifteen or thirty kc. from primary channels) be permitted to satisfy the required frequency coordination by demonstrating compliance with the provisions of section 10.8 (b) or (c) of the Commission's rules.

Previously an applicant for these frequencies had to have the consent from all licensees authorized to operate on frequencies thirty kc. or less removed from the requested frequency whose station is within seventy-five miles of the applicants proposed station location.

The frequencies to be affected will be those "split channels" in the forty-two to fifty mc. band and in the 150.8-162 mc. band. The specific rule amendment will be merely to delete the footnotes presently attached to the frequencies involved thereby permitting those frequencies to be assigned as though they were primary channels. This will include "elimination" of the developmental tag now attached to the fifteen kc. splits.

The Commission has invited written comments by July 21 by anyone interested in opposing or supporting the proposed change.

FCC COMPLETES ALLOCATION STUDY

. . . Citizens retain 450 channels

The Commission has completed action on a long-standing frequency allocation docket by reallocating the band 161.625-161.775 mc. for the exclusive use of remote pickup by broadcast station licensees.

At the same time this action was finalized the Commission announced "no action has been taken" on the proposed changes in the 462.525-463.225 and 465.275-466.475 mc. bands. It had been originally proposed that these frequencies, now allocated to the Citizens Radio Service, be reallocated to the industrial radio service, "since the allocation of the former citizens band (460-470 mc.) is involved in the separate allocations docket on "split channels" in the 450-470 mc. region.

At the same time the Commission turned down a joint petition filed by United Press and Associated Press which had requested further frequencies for relay press work in the VHF service. The Commission noted it "realized that existing allocations in the press relay service are inadequate" but noted the entire VHF range is in the same fix, and nothing can be done "at this time" to alleviate the situation.

INTEREST HIGH IN 952-960 OMNI RULE PLAN

. . . Seven unpaired freqs at stake

The Commission has received a goodly amount from interested future users of thirty-six frequencies in the 952-960 megacycle band. High up on the comment list are comments backing seven proposed pairs for omni-directional use. Interest in such operation was clearly in evidence from not only public safety groups (i.e. traffic light control, etc.) but also from several special interest private and public groups.

The California State Communications Advisory Board concurred with frequency pairing proposed by the FCC. The group also restated its belief that the public safety services do have a very definite need for frequencies in the 952-960 mc. region for omni-directional operation. Summarizing the CSCAB comments, they concluded (1) 952.5 mc. is satisfactory for traffic light control, but additional frequencies will be needed in areas of concentrated population or irregular terrain, or where a number of municipalities surround a body of water; (2) there is a need for backup alarm and signal circuits between fire headquarters and area fire stations; (3) these frequencies could be used for various types of control circuits on simplex where paired frequencies would be unnecessary; (4) these frequencies on omni-directional operation could be used for printer of facsimile operation circuits, most of which could be on simplex, leaving paired frequencies for duplex; (5) past experience indicates that public safety services will be able to show valid requirements for additional systems using omni-directional radiation patterns that will give satisfactory service and could not be justified economically on frequencies above 16,000 mc.

The City of Los Angeles favored assignment of channels 952.1 mc. through 952.7 mc. for omni directional uses, available for fire service.

The Electronic Industries Association (Land Mobile Communications and Microwave Sections) supported the FCC in their docket and also commended the Commission "on its continuing effort to amend the rules regulating the use of private microwave frequencies above 890 mc. and to encourage greater and more efficient utilization."

The National Committee for Utilities Radio believes that the FCC proposal is "entirely logical" and urges it be adopted, subject to certain reservations concerning the channel bandwidth of 100 kc. The NCU said the 100 kc bandwidths pose certain problems which can be handled without serious injury if certain provisions are made. Among the suggested "provisions" were (1) provide an amortization period of eight years for those systems now authorized; (2) where a particular requirement cannot be met with 100 kc. bandwidth, the FCC should consider on a case-by-case basis allocation of adjacent pairs; (3) if only five voice circuits are required, the operation could be kept within 100 kc., and commercial equipment may be available; (4) permit the use of these frequencies for "spurs" for extended microwave operations.

MORE 450 MC SPLIT PROPOSALS

. . . Horizontal Polarization?

In a set of late comments filed to the FCC in connection with the Commission's outstanding rule proposals to "split" mobile channels in the 450-470 megacycle band from fifty to twenty-five kc. spacing, HyGain Antenna Products Company of Lincoln, Nebraska has suggested that the use of horizontal polarization on all of the new twenty-five kc. channels, with continued vertical polarization of existing assignments, would do much to reduce possible adjacent channel interference.

The Hy-Gain Company requested that its proposal be considered, "even though late."

The company pointed out that its initial laboratory experiments "have shown that cross polarization of the same channel is in the order of twenty to thirty db. without any special precautions and that "by careful engineering radiated cross polarized energy could be reduced as much as fifty db."

The company added "the cost of horizontally polarized antennas would not vary appreciably from vertically polarized antennas for similar service, either mobile or fixed."

ERIE ASKS "DEFERED ACTION" ON 39.06

. . . Would use twenty kc. bandwidth

The City of Erie, Pennsylvania, whose petition triggered off the FCC rule proposal in the first place, has asked the Commission to "defer further action" until early July on the agency's proposal which would make the police radio frequency of 39.6 mc available in the local government radio service for use by transmitters in moving emergency vehicles to control the traffic lights ahead of emergency cars.

By July 3, Erie said, it "believes it will be prepared to file a petition seeking modification of the rule making order which will have the effect of reducing the bandwidth contemplated for traffic light control function from thirty-two kc. to twenty kc."

Erie said that when its original petition was filed last December it believed a bandwidth of about thirty kc. was required in order for the emergency traffic light control device to be "technically reliable and stable, yet at the same time economically feasible for the use intended."

TV GROUP SEEKS SQUELCH ON P.S. TV CHANNEL

. . . AMST asks denial of special U channel

The Association of Maximum Service Telecasters, Inc., which describes itself as "an association of approximately 160 television stations (eds. note . . . all VHF stations) interested in maintaining wide-area, high technical quality television service in the public interest" has filed opposition with the FCC to the recent petition of the International Municipal Signal Association and the International Association of Fire Chiefs for allocation of a single UHF television channel on a nationwide basis for TV operations of public safety organizations throughout the country.

The TV group said "it is clear that the IMSA-IAFC proposed uses would not be broadcasting since the transmitted signals would not be intended for reception by the general public," and FCC adoption of the proposal would deprive the public of important spectrum space now allocated to television broadcasting."

AMST asked that the public safety petition be denied "without further proceedings."

MINOW STRESSES MOVE TO UHF-TV

During May the Chairman of the FCC (Newton Minow) once again made himself very clear when he told a gathering of broadcasters "the FCC will take every possible step to break through the allocations barrier into the UHF television band." He added "We will put this sleeping giant to use and in the years ahead we may have twice as many channels operating in cities where now there are only two or three."

RULE MAKING FINALIZED FOR ALASKA TROPO SYSTEM

The FCC has finalized a rule proposal which will permit allocation of the upper end of the UHF television spectrum, 800-830 megacycles, to the domestic public radio service in southern Alaska, thereby permitting licensing of the Alaska Telephone Corp. for a tropospheric scatter system from Ketchikan to the northwestern United States.

No objections to the proposal were received by the Commission. The rule making was necessary because of the original allocation of the spectrum space to television channels sixty-nine through seventy-three.

REMOVAL OF DEVELOPMENTAL RESTRICTION

. . . Private microwave above 952 mc.

General support of FCC rulemaking under which the developmental restriction on private microwave would be released has been received by the Commission. The FCC proposal would permit the licensing of private microwave systems on a regular basis in certain bands above 952 mc.

Typical of the comments received was this one from the City of San Diego (California). ". . . heartily in accord with the Commission's proposal to remove the developmental restriction on microwave systems in the 952-960 mc. and 6,000 mc. bands for which interim technical standards have been established."

The EIA filing also supported the FCC proposal with the reservation "we suggest the Commission specify the upper limit to the area in which the new rules will apply, as well as the lower limit of 952 megacycles. Said the EIA microwave section "For example, above 16,000 mc. equipment is not now available for the private microwave user. At the most, such equipment is in the early research and development stage; its final form, both as to technical and operational characteristics, is unpredictable at this time. Therefore in the public interest it appears in the public interest to limit this proceeding to the bands 952-16,000 mc."

NEXT STEP UP TO FCC

. . . Northern California frequency fight

The next step in the local government radio service dispute between the California counties of Siskiyou and Yolo (see June issue, CH) appears to be up to the FCC following a brief reply letter fom Siskiyou County to the Commission. The letter indicated Siskiyou intends to "resist" a petition from Yolo which requests an FCC order "to show cause" why Siskiyou should not change the frequency of one of its mobile relay stations which is interfering with Yolo's system.

In its petition Yolo had noted that the Siskiyou operation covers "an area greatly in excess of that necessary for satisfactory communications within the county, and thus is not in compliance with section 10.106 of the Commission's rules, which imposes upon every Commission licensee in the public safety radio service an obligation to use no more power and antenna height than is needed to cover the area to be served."

In its reply, Siskiyou said, in effect, that it will stand on earlier representations that it has tried to eliminate the interference in some ways, but that it must have the antenna elevation afforded by Mt. Shasta.

MOTOROLA SUPPORTS POLICE REPEATER

. . . Specifies suggested system

The Motorola company has filed a set of comments backing the APCO-FCC petition to authorize "mobile repeater operation" of police car mobile transmitters as a means of relaying the signals of hand carried miniature units back to the base station from a man in the field. The Motorola filing, lengthy and quite complete, also spelled out a "suggested system" which Motorola engineers developed for the proposal.

Briefly, the company's system works as follows.

"The proposed system provides normal mobile communications on frequencies one and two portable communications on frequency three. At the option of the mobile operator, a switch is operated which will select the frequency three receiver and will set-up the mobile unit to relay automatically properly coded transmissions from the portable transmitter to the base station. The switch is used so that more than one mobile equipped for automatic relay, within range of the portable transmitter, will not be activated.

"A base station selects frequency three to respond directly to the portable receivers and is used only for Communications with portable equipment. Coded portable transmissions are used in order that the base station will not activate the automatic relay in the mobile. Monitoring provisions on frequency three in the mobile will provide access via the automatic relay to the base station by regular portable equipment equipped foot patrolmen on an "as-required" basis.

"By means of a code disabling switch on the portable equipment, portable-to-portable communications can be maintained and not activate a mobile automatic relay. Since all base-to-portable communications are direct, portable equipped patrolmen can be advised when automatic relay equipped mobiles are in the vicinity making communications from the portable to the base station possible. Direct communications from mobile to portable are possible with a portable transmitter only in the vehicle.

CH SHOWCASE

The *Lane Electronics Phone Patch* consists of an inductive pick-up coil and other associated transistor circuits. The little box will work into any standard base station transmitter and allow automatically switched voice operated interconnection of a telephone line into a 2-way system with the added advantage of amplified sidetone.

It will enable persons in the room to monitor the conversation at the same time. Normal station operation is not impared and no switches need be thrown to place the patch into operation.

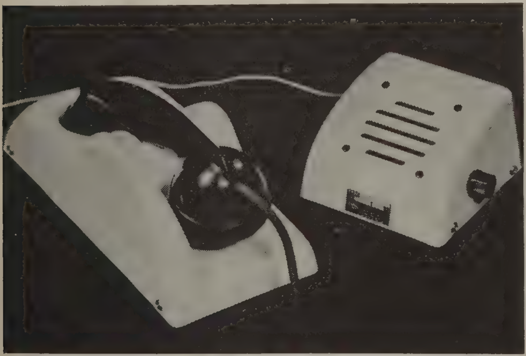
The manufacturer claims that the patch will hook up to a transmitter in about twenty minutes.

The unit is being sold through distributors and directly from the manufacturer at Box 21, Compton, California.

DB

Decibel Products (P.O. Box 10764, Dallas 7, Texas) announces a new general purpose station antenna covering the range from 25 to 470 mc.

Designated the DB-201, it is a basic folded radiator with ground plane employing a new design approach to the insulated portion of the radiator, according to the manufacturer.



LANE ELECTRONICS PHONE PATCH requires twenty minutes hook-up for inductive coupling into a telephone line from a two-way system.

The 50-ohm feed-through connector is completely encapsulated in a moisture and corrosion proof, tough, durable molded epoxy plastic insulator. The strength of this insulator permits an unusually rugged antenna design which is capable of withstanding winds of 125 miles per hour.

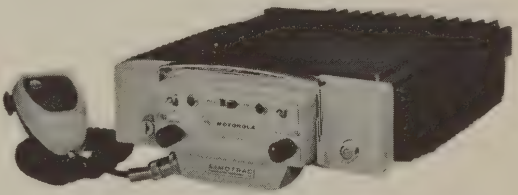
The antenna is pre-cut and pre-tuned, thus eliminating any need for field cutting or adjustment.

The company advises that they will send full details on the antenna.

MOTOROLA

New from Motorola is a new twelve kmc. microwave transmitter-receiver, the MR-40. The unit provides broad-band communications particularly suited for high speed data transfer as well as transmission of conventional telephone and teletypewriter messages.

The MR-40 can carry data at 62,000 characters per second when used in conjunction with Motorola's new data transmission multiplex system. This speed, which the company claims is twenty times faster than the capacity of wire lines, facilitates linking information gathering and programming facilities to central computers.



MOTOROLA EXTENDER virtually eliminates annoying ignition noise interference which drowns out 25-50 mc. low band mobile signals. Available in the MOTRAC two-way radio line, the unit features a three position switch on the control head for (a) automatic ignition noise suppression, (b) intermodulation rejection, or (3) standard receiver operation. (See below)

Data transmission utilizes only a portion of the carrier beam provided by the MR-40. It can also handle voice, fax and teleprinter transmissions as well as control and monitor functions with 600 or more multiplexed channels.

The unit has 100 milliwatts power output, its circuit containing two reflex 20,000-hour Klystrons. It can be used with both directly aimed dish antennas and tower-mounted passive reflectors.

"The first really effective solution to the degrading effects of ignition noise" has been announced by the *Motorola Company*. Motor-

AREOTRON 7N20 two-way low band mobile transceiver packs a lot of radio into a small case!

ola reports their new "*Extender*" operation makes use of patented circuitry which "*represents one of the outstanding achievements in two-way radio in the last decade.*"

Briefly, this is how the Motorola system works. The ignition noise problem has increased markedly in recent years due to a combination of factors, which must include *higher* compression engines, increased highway traffic, and the switch to narrow band techniques. As a consequence mobile units attempting to work other mobiles, or to the base over anything greater than short or short-moderate distances, find the signal buried behind a wall of ignition noise. In the new Motorola "Extender" circuit the noise impulses from auto ignitions are detected (automatically) in the early stages of the receiver. Extender operation "turns off" the mobile receiver for the two-three microsecond duration of *each* ignition impulse. Since it takes hundreds of microseconds to utter a single vowel, quieting the receiver for the ignition impulse period does not impair the clarity of the message, according to Motorola.

The new Extender operation is now available in the *Motrac* twenty-five to fifty mc. units.

AEROTRON (Aeronautical Electronics, Inc.)

(AEROTRON), P. O. Box 6527, Raleigh, N.C. announces their Model 7N20 two-way low band mobile radio transceiver.

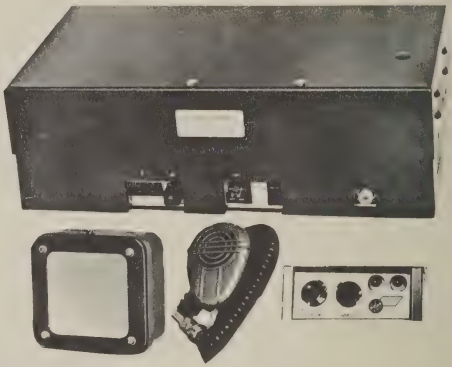
The transmitter puts out twenty watts minimum with 20F3 modulation; plus or minus five kc. deviation for modulation at 1000 cycles.

The receiver covers twenty-five to fifty-four mc. with 0.3 mv. sensitivity.

The station will operate from 117 VAC 13.6 and 6.8 VDC.

KAAR

A quick check across the 1.6 to 8 mc. frequencies will help you to realize that there is still quite a bit of two-way activity in this region. The *Kaar Engineering Corp.* (2985 Middlefield Road, Palo Alto, Calif.) has a model TR 245 mobile (AM) radiotelephone which covers this portion of the spectrum with twenty-five to thirty watts from a six or twelve volt source. A portable model of this unit, called the TR245 is also available.

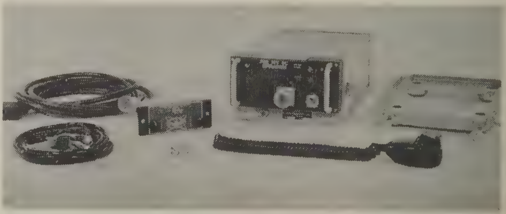


KAAR TR245 ALL PURPOSE MOBILE AM radiotelephone operates from 6 to 12 volts with 25-30 watts out in the 1.8-6 megacycle range.

The TR245 is designed for installation in cars, trucks, Jeeps or other vehicles. The transmitter and receiver are strip-chassis constructed to permit easy access for maintenance. All controls are contained in a dash mounted control head.

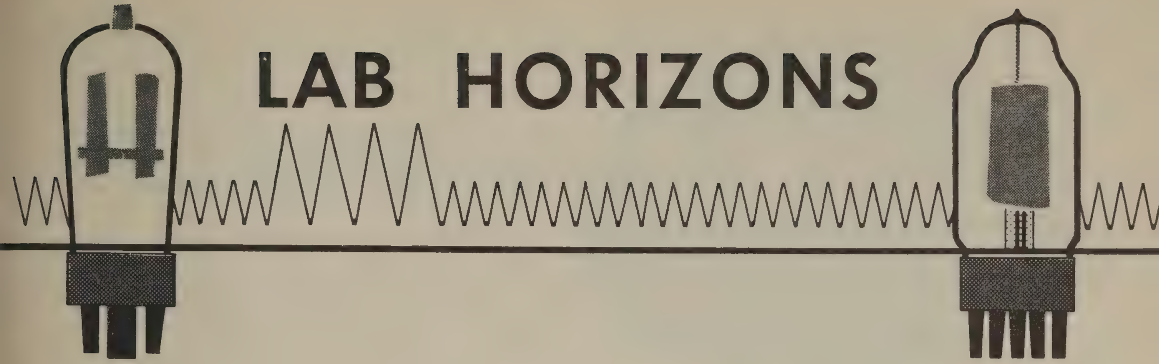
COMCO

Forestry department officials and other agency levels which suddenly find themselves "*behind-the-eight-ball*" for communications



COMCO FLIGHTCOM low and high band installations combine light weight operation, extremely rugged design and quick transportability. Shown here, the complete model 582 installation kit.

(Continued on page 27)



LAB HORIZONS

by Jim Houston
CH "Service Bench" Editor

CHECKING ANTENNA SYSTEMS

Here's a handy step-by-step procedure for checking out antenna systems which are suspected of causing trouble.

The whole analysis revolves around properly analyzing *tuning indications.*

(1) NORMAL ANTENNA LOADING—Line and antenna OK-50 ohms. Plate amplifier dips correctly, with ten percent coupling antenna tuning will peak OK and you can couple UP easily to the rated cathode reading.

(2) *OPEN LINE*—somewhere in the antenna system the center conductor has opened. Plate amplifier will dip OK with ten percent coupling but cathode reading is way over rating. Even uncoupled the antenna tuning will give a high cathode reading.

(3) *SHORTED LINE*—Water, bad connection, or frayed braid on the coax. With ten percent coupling the antenna tuning *will* peak, but the peak will be a small one. Increasing the coupling all the way probably won't give you more than fifty percent of the rated cathode reading. In short, you can't seem to load up!

One word of caution however. Never leave the PA loosely coupled to the antenna system for an extended period of time as this causes high reflected power (SWR) which can easily damage the final amplifier stage.

WATCH OUT FOR FOAMFLEX DAMAGE!

Many two-way users are making more and more use of the extremely low-loss FOAMFLEX cable. New (and many old time) users should keep these suggestions in mind as the Cable can be damaged when drawn up to a tower with steel wraplock.

It seems that the sharp edges of the wraplock impress the aluminum jacket of the cable sufficiently to set up a strain forcing the cable to crack along the strain point at the wraplock connection, as wind whips the cable back and forth. 1/2" Foamflex is especially prone to damage from tight wraplocking. It of course follows that jacketed cable will give many of the same problems as Foamflex.

Recognizing the difficulty of controlling how tightly the wraplock is applied, *CECO Inc.* of Dallas recommends using a weather tight resistant tape applied every five feet instead of wraplock. *Minnesota Mining No.* 870 tape seems to fill the bill very well, as it is designed for outdoor installations and resists all types of weathering including corrosive atmosphere and ultra violet deterioration.

On towers with butt welded flanges, run the Foamflex down the tower face instead of the leg so as to avoid sharp edges. Tape to cross and angle members every five feet.

A good wrap job requires about two feet of tape. Minnesota Mining No. 870 tape costs around $4.60 per 60 yard roll, so each roll is good for nearly 100 wraps (or 500 feet of cable with a wrap every five feet). This is a fast, inexpensive method of getting around wraplocks, and it doesn't crimp the cable style. J.H.

CB SERVICING

(Continued from page 14)

is what I'm here for, isn't it?"

He turned away and approached the two CBers with the mutilated rig, shaking his head and saying, *"Well, well, what have we this time?"* R.P.S.

SIRSA SIGNALS

prepared monthly by
G. KENNETH ADAMS
Executive Secretary
Special Industrial Radio Service Assoc., Inc.

Editors note: *Communication Horizons* donates this space monthly to the SIRSA so that this nation-wide group of industrial radio users might express their "views and comments" via print in this, *the nation's two-way radio magazine*. The views expressed by the SIRSA do not necessarily represent the views of Horizons Publications, its publisher or the editors of this publication. *R.P.S.*

MR. MINOW MINCES NO WORDS

When a relatively obscure law partner of Adlai Stevenson's was named chairman of the Federal Communications Commission, it was natural for all parties concerned to speculate as to what *kind* of agency leader he would make. Possessing a background of experience which included few activities in the field of radio or TV, Newton Minow was an upknown quantity.. Recently the new Chairman addressed a gathering of the hierarchy of commercial broadcasting and by his remarks he definitely removed any "X factor" in his pertitude towards his job. *Mr. Minow has taken a stand.*

According to the news columns, this stand is practically unprecedented. The trade press says it has "*no recollection*" as to the last time that an FCC Chairman or any other Commission official for that matter had "laid it on the line" as succinctly and pointedly as Chairman Minow did in his speech to the broadcast industry's moguls. Specifically, the Commissioner took the telecasters to task for the type of programming they are offering the viewing public. In his opinion, much should be done to raise the level of all network entertainment, and particularly that portion which is directed to the junior age levels. He even took the deep plunge and alluded to the fact that the TV licenses are not renewed automatically, without examination of the licensee's past record in the light of his responsibilities to the viewing public.

The only immediate discernable reaction to Mr. Minow's talk before the NAB (National Association of Broadcasters) came from the television critics. To a man they supported his viewpoint. Many of them have long complained about the type of material aired for public consumption, and evoking the power of the disenchanted viewers to demand better video fare. The opposition to Mr. Minow was less audible. It can best be described as a ground swell of grumblings lapping to the shores of TV officialdom. The network wheels are uncomfortable in front of the pointed finger!

Now . . . *just how does all of this affect the Special Industrial Radio Service, and other forms of two-way VHF-UHF communication services?*

Although Mr. Minow, in keeping his words germaine to his audience, did not refer to the non-broadcast services, he did say that the FCC "*will take every possible positive step*" to encourage the movement of television broadcasting to the UHF channels. Commissioner Lee carried this a step further when he told *Communication Horizons* publisher Bob Cooper (see June CH, "*What About the VHF TV Band?*") such a move would open up the presently un-occupied VHF channels for immediate sub-allocation by all users of industrial and commercial two-way radio.

In a broader sense Mr. Minow's address to the NAB can be construed as a new "*statement of principles*" by which the FCC intends to guide the destinies of the regulated airwaves. In this sense it follows that he will attack the other problems confronting his agency with the same zeal. Obviously, due to the nature of commercial broadcasting, he must give this service priority attention. *However he must also be made aware of the major problem now facing the non-broadcast bands: namely frequency congestion.* There should be no doubt (now) that Mr. Minow already has full access to a statement which clearly points up this problem. The statement we refer to was made by an FCC official testifying before a Congressional Committee. The speaker was the *Chief* of the *Safety and Special Services Bureau, Curtis B. Plummer* He was speaking before a house subcommittee when he stated that *"by the end of 1962 it will take my bureau more than ten weeks to process a license application."*

We believe Mr. Minow would agree that this one fact in itself is sufficent reason for the new Chairman to devote some of his attentions to the Special Industrial and allied services.

As spokesman for the users of Special Industrial radio, SIRSA salutes Chairman Newton Minow for his *"declaration of intentions."* To use a favorite phrase of the man who appointed him, *"we are hopeful"* that he will be able to follow through with his program, and that his *"follow through"* will include some form of relief for the long suffering VHF cochannel users.

G.K.A.

PRIVATE MICROWAVE

(Continued from page 18)

Disadvantages of Microwave Relative to HF

Natural Barriers

Large masses of water and extreme mountain ranges and other inaccessible areas are real deterrents to microwave systems. However, man's ingenuity usually finds solutions to apparently insoluble problems. Space communication systems in the microwave spectrum are becoming a reality which will permit the present HF spectrum width to be expanded by as much as 500 times for world-wide point-to-point systems.

Economics

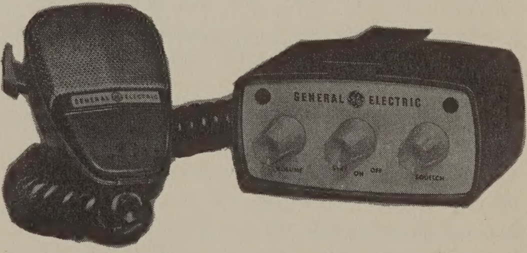
For low density circuits (less than six voice channels), HF costs less than microwave. However, most communication requirements grow rapidly, nurtured by the availabilty of good, reliable circuits, with the result that HF capacity is exceeded long before it can be amortized. Microwave, sometimes not the most economical initial facility, is usually the soundest investment over an extended period.

CH SHOWCASE

(Continued from page 24)

during the summer's expanded fire-fighting and public safety season should keep these thoughts in mind. *Communications Company, Incorporated* (Coral Gables, Miami 34, Florida) has a light weight (slightly over seventeen pounds in standard package) series of *FLIGHTCOM* FM transmitters and receivers ideally suited to both "emergency" and routine operation. The *FLIGHTCOM* model 580 covers the twenty-five to fifty megacycle range with thirty-five to forty watts of transmitter output while *FLIGHTCOM* model 582 covers the 144-174 megacycle range with twenty-five to thirty watts out. Receiver sensitivity for twenty db. signal to noise ratio is .4 uV for the low band version, .6 uV for the high band unit. Both units come with a light weight transistorized power supply, to operate from twelve or twenty-four volts DC.

Both units are on the FCC *"List of equipment acceptable for licensing"* and are certified by the FCDA. During the 1960 fire season in California, COMCO provided more than 100 units on a cash basis to west coast forestry departments.



GE's NEW TRANSISTORIZED CONTROL HEAD is the latest addition to their progress line.

GE

General Electric (Lynchburg, Va.) has just announced a new transistorized two-way radio control head to be used with their transistorized *Progress Line* of mobile communications equipment.

Manufactured by the G-E *Communication Products Department*, the compact lightweight design minimizes the space required at the dashboard. The control unit is 2¼ inches deep, 2¾ inches wide and 4⅝ inches high.

The control head has a three-position OFF-STANDBY-ON switch, enabling the operator to take advantage of lower battery drain made possible by extensive transistorization. When the switch is on "standby," the radio is ready to receive a call and consumes only .040 amperes from the battery.

A NEW PLAN for FREQUENCY COORDINATION

The merits of an allocation system which provides for block allocations of frequencies to mobile radio services on a local basis are too promising not to be considered by the FCC, members of the American Petroleum Institute's Central Committee on Communication Facilities agreed during the final stages of a petroleum communications meeting held in Washington at press time.

The API group suggested that the allocation plan—presented by Dr. William M. Rust, Jr., of the Humble Ail and Refining Co., during the FCC's 1959 hearings to develop allocation plans and radio usage policies for the spectrum between 25 and 890 megacycles—should be unearthed from the stack of testimony in the overall hearings and be given a closer look by the commission.

The group authorized the transmittal of a copy of the plan to the new data processing division of the FCC, for that organization's study as to how such an operation would fit into projected computer activities at the agency.

The basic theory of the projected allocation plan, as explained during the FCC hearings by Dr. Rust, is that while it "retains the simplicity of the block allocation system in processing an individual application," it also "provides an orderly, relatively simple method for geographical sharing and thus achieves essentially as efficient utilization of the radio spectrum as would theoretically be possible under a 'pool allocation system'."

At the time of the hearings, Dr. Rust noted that "while the principles of this geographical allocation system might be applied to all services, the problems involved would be greatly simplified if it were applied only to a group of somewhat related services, for example, the industrial services. Later it might be extended to include other services."

The plan would divide the U.S. into about fifty zones, with a loading factor in each zone defined in terms of such elements as number of users, base stations, and mobile stations operating on each channel within the zone. Each service would be assigned a maximum channel zone loading factor based on the nature of the radio use.

A service requiring heavy two-way communications vital to safety of life and property and incapable of tolerating appreciable interference would be assigned a low maximum channel zone factor. A dispatching type service, such that substantial interference would not adversely affect the public would be assigned a high maximum channel zone loading factor. Either the channel zone loading factor formula or the maximum channel zone loading factor might be different for different frequency bands.

For the purpose of determining the channel zone loading factor, all services sharing a channel would be considered as a single service. As Dr. Rust explained, "Within each zone and for each service and for each frequency band, the channels are tentatively arranged in order of the channel zone loading factor. For each zone and for each service and each frequency band this order is then modified to provide a reasonable compromise between this tentative order and an order that would place the channels, presently allocated to the service, in a given frequency band, in a small number of blocks arranged by frequency—either ascending or descending."

"As an example of the compromises to be made—the average loading of split channels is now low, nevertheless they should automatically be placed with the primary channels from which they are derived."

"Channels now shared by two or more services should be exclusively allocated in each zone to a single service and the users in the other service should be offered the option of remaining on their present channel for five years or shifting immediately to a channel allocated exclusively to their services."

SERVICE BENCH TYPES— ATTENTION!

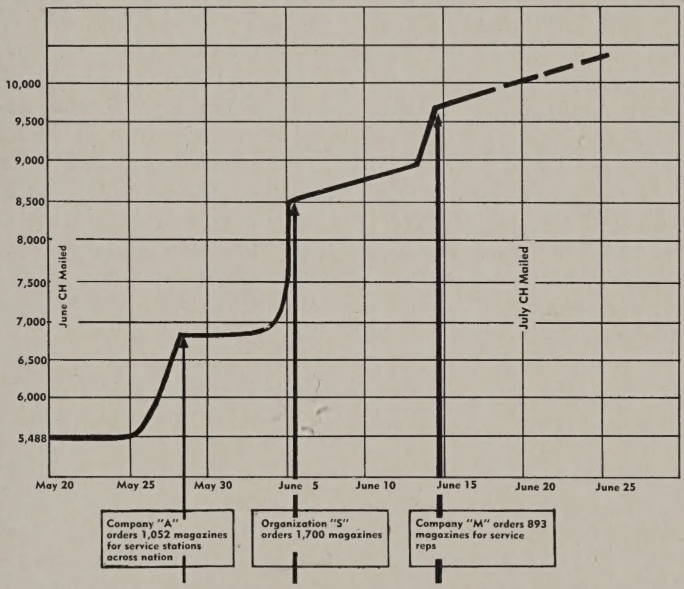
Every two-way installer and maintenance man has his own way of doing things. We invite you to send along photographs, schematics, circuit modifications or short (preferably type-written) *"hints and kinks"* (our apologies to QST) as you use them. CH is particularly interested in (1) short stories which show methods of unit installations and pull out, (2) descriptions of antenna installations on the "unusual side," (3) "first of a kind installations" in new or unusual cars, trucks, etc.

We will pay from $5.00 to $25.00 for all photos, circuits, ideas, etc. which appear in print.

ONLY 30 DAYS OLD...

and already COMMUNICATION HORIZONS IS HAILED AS THE MOST COMPREHENSIVE—NEEDED PUBLICATION TO COVER THE WORLD OF TWO-WAY!

- Circulation figures tell the amazing story of growth!
- Reader response from each of the 50 states, and 6 foreign countries!
- Overwhelming acceptance by manufacturers!



INCIDENTALLY . . .

We thought you might be interested in a few of the comments and reactions to the first issue of COMMUNICATION HORIZONS.

Ninety per cent of the mail received relating to our editorial format mentioned praise and "thanks" for our appointment of ROBERT E. TALL of Washington, D.C. as our WASHINGTON BUREAU CHIEF.

Forty-seven per cent of the reader mail second-guessed us with requests for monthly news and views from the nation's private, industrial and municipal two-way organizations. We are most pleased to report the SPECIAL INDUSTRIAL RADIO SERVICES ASSOCIATION (SIRSA) is the first of such groups to begin a regular monthly "sounding board" with COMMUNICATION HORIZONS. Two additional similar columns are pending from APCO and the NMRS.

Twenty-three per cent of the reader mail asked for an expanded technical section. We are pleased to report this is in the mill (with complete apologies to any and all who took last month's "IGNITION NOISE SUPPRESSION" material SERIOUSLY!) with a full four page monthly section upcoming shortly.

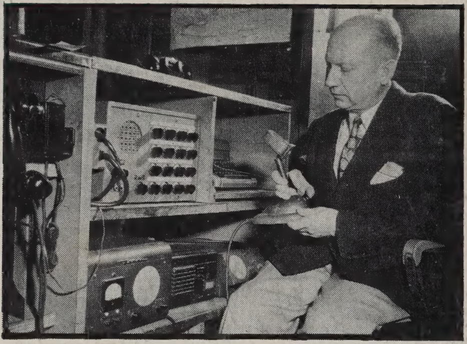
But most of all, we are pleased to note that only one per cent of the reader mail did not mention "general interest articles" per se. This, we believe, is our best indication that YOU WANT TO KNOW what is going on in the two-way field, with TIMELY — IN DEPTH REPORTS of interest to every user, installer and seller of two-way radio equipment.

See you in August —
THE APCO PRE-CONVENTION ISSUE!

Rick Stauduhar, K6ERG

Managing Editor, Communication Horizons

"I'm a two-way Radio User and I WONDER . . .



.... **Will my equipment be obsolete in the next few years?"**

.... **What effect will pending FCC channel changes have on my system?"**

.... **Is my system in danger of co-channel interference?"**

.... **How can I protect my investment and maintain or improve my communications range?"**

Dear Mr. Two-Way User:

These are common questions these days.

So important are these questions that HORIZONS PUBLICATIONS makes available this new publication aimed directly at the two-way radio user and his problems.

COMMUNICATION HORIZONS reports to you on the very pulse of the industry — new products, late FCC news, engineering and user reports, and special in-depth features of specific interest to YOU, the two-way user.

Just one of the many special reports scheduled for next months' COMMUNICATION HORIZONS is a comprehensive study and report prepared by our *Washington Bureau Manager, Robert Tall,* about the possibility of relaxing CONELRAD regulations for two-way users.

Your best insurance that your firm's communication system will be updated with regulation changes and equipment developments is a subscription to COMMUNICATION HORIZONS — very simply obtained by completing the below subscription form and returning it to us with your check for $4 for twelve months.

Yours for better two-way radio,

Robert B. Cooper, Jr., K6EDX

Publisher-Editor

COMMUNICATION HORIZONS MAGAZINE
P. O. Box 3206
Modesto, California

Yes Bob,

We're interested in keeping abreast of the latest developments in two-way radio. Here is our $4 for twelve informative issues of COMMUNICATION HORIZONS MAGAZINE.

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